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RADIUM

EDITED BY
CHARLES H. VIOL, Ph. D.
AND
WILLIAM H. CAMERON, M. D.

VOL. XII JANUARY, 1919 No. 4

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A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

RADIUM

A MONTHLY JOURNAL DEVOTED TO THE CHEMISTRY, PHYSICS AND THERAPEUTICS OF RADIUM AND RADIO-ACTIVE SUBSTANCES

Edited and Published by Charles H. Viol, Ph. D., and William H. Cameron, M. D. with the assistance of collaborators working in the fields of Radiochemistry, Radioactivity and Radiumtherapy.

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VOL. XII JANUARY, 1919 No. 4

RADIUM THERAPY AT THE MEMORIAL HOSPITAL IN NEW YORK CITY

The following excerpts with regard to the use of radium in therapy are made from the thirty-third annual report, for the year 1917, of the Memorial Hospital, for the treatment of cancer and allied diseases. The summary of the work with radium at the Memorial Hospital as presented in this work is of the highest interest. Radium therapy in the treatment of many conditions must now be recognized as offering most to the patients, and along this line as well as in the making of advances much may be expected from the work at the Memorial Hospital. The Radium Department at the Memorial Hospital is organized with the following staff:

William Duane, Ph. D. ..... Associate Consulting Physicist
Henry H. Janeway, M. D. ..... Physician-in-Chief
Douglas Quick, M. D. ..... Assistant
Harold C. Bailey, M. D. ..... Gynecological Department
Benjamin S. Barringer, M. D. ..... Urological Department
Gioacchino Failla, Ph. D. ..... Physicist

"The year 1917 was a noteworthy period at the Memorial Hospital in the development of radium therapy of cancer and allied diseases. In addition to being the second year in which the supply of radium was sufficient to treat a larger number of cases, the new laboratory building, given to the hospital by Dr. James Douglas, was completed, and the work for which it was designed was started and has been so well maintained that already the optimism and vision of its donor appear to be amply justified. The vault for the storage of the radium has been skillfully connected with a pumping apparatus, so that the daily withdrawal of the emanation for therapeutic use is rarely interrupted. Instruments for promptly measuring the radioactive value of each emanation tube

permits the medical staff to accurately estimate the dosage required for each lesion treated. In the physical laboratory the applicators are promptly made and new ones are constantly being designed so that at the present time numerous new methods of treating the disease have been adopted, which less than a year ago were not available. Researches on the physics of radium are also under way."

STATISTICAL REPORT FOR THE YEAR ENDING DECEMBER 31st.

	1915	1916	1917
Total Number New Patients Radium Department....	288	439	446
Total Number Treatments Radium Department.....	685	1171	1590

The following is a summary of the work of this department for 1917:

Breast	6
Prostate	6
Cheek (Bucal and Surface)	9
Esophagus	14
Eye	67
Glioma	3
Lip	24
Lower Jaw	21
Lymph Glands (Primary)	4
Lymphosarcoma	7
Larynx	9
Leukaemias	8
Hypernephroma	2
Keloids	3
Mediastinal Growths	2
Melanoma	6
Naevi	17
Branchiogenetic Carcinoma	9
Nares	3
Parotid	4
Pancreas	1
Penis	2
Pituitary Body	1
Rectum	40
Sarcoma	34
Skin	104
Superior Maxilla	18
Stomach	16
Tonsil (Pharynx)	31
Teratoma	4
Thyroid	4
Uterus	21
Total	430

"The practical results, in general, of the use of radium in cancer justify the hopes that have been previously expressed in our reports. A full report published during this year and other contributions to the literature of radium therapy in cancer have done much to interest the medical profession in this work. This report is being translated into Spanish. The work of 1917 has demonstrated that numerous lesions in and about the mouth and throat are best treated by radium. A review of the work on cancer of the lip indicates that it may often be superior to excision by the knife. Lesions close to the eyelids are undoubtedly treated better by radium as by this method the deformities of the eyelids which often follow the removal with the knife are avoided. The use of radium in leukaemia, Hodgkin's disease and lymphosarcoma has been demonstrated to be superior to any other method hitherto employed."

"The department of physics has profited by the assistance of Prof. Duane who has devised an improved system of handling the radium applicators, installed a new apparatus for rapid measurements, and begun

a series of researches in the physics of radium which have had an important influence on the methods adopted for treatment. Mr. Failla has constructed a new and improved apparatus for collecting radium emanation and designed many practical improvements in the form of applicators. Several visiting physicians have received instruction in the methods of collecting and handling radium emanation, as well as its use in therapeutics. Although the supply of radium has steadily increased and now amounts to nearly 4 grams, the demands for emanation within the hospital have more than kept pace with the supply. During the year the first Radium Report of the hospital was issued and distributed."

"Our radium is now stored in a suitable vault adjoining the radium workshop, and protected electrically by the Holmes Electrical Protective Co. The quantity of radium in the hospital has been increased to 3,560 mgs."

"In the Radium Department there were treated 446 as compared with 439 in 1916; while during the year a total of 1,590 radium applications were made."

"DEPARTMENT OF GYNECOLOGY. The use of radium in cancer has now reached a stage where not only advanced and inoperable cases are treated, but also those that are on the border line of operability. The result of many of this latter class have been so remarkable that the indications point to treatment, in the future, of early cases of the disease by radium rather than by operation. Before this advance may be made time must elapse to show if the results of our clinical cures of 1915 and 1916 are permanent; and also our technic must be so perfected that the entire pelvis may be effectively radiated without damage to the normal tissues."

"Our most important field of work may be said to be the improvement of our methods of application so that the points distant from the main portion of the tumor—the very outposts of the disease—may receive a lethal dose. Data is rapidly accumulating concerning the types of tumor most susceptible to the action of radium; the best method of approach and application and accomplishment of the full treatment without distress or harm to the patient."

"The entire hospital supply of radium is at the disposal of the department for two days a week, and through the interest and untiring energy of members of the interne staff the larger portion is constantly in use during the 48 hours."

"The cases are followed at a weekly return clinic and results are recorded to determine the methods that are successful and outline future paths for research."

"Further development of the treatment of fibroid tumors with radium promises effective results in certain of these cases unsuitable for operative measures."

"At the end of the year a report with the presentation of the cases informs the medical board of the work accomplished by the department."

"In 1915 and 1916 there were 50 cases of cancer of the uterus treated each year. There has been not only a considerable increase in the number treated in 1917, but there has been also variation in the type of case."

"DEPARTMENT OF UROLOGY. During the past year the Department of Urology has treated about twice as many cases of carcinoma of the prostate and bladder as in any previous year. Problems associated with

the diagnosis and treatment of these grave diseases have been studied and some advance has been made along the lines of earlier diagnosis and more accurate treatment. The outlook for the radium treatment of carcinoma of the bladder, with not only palliation of this condition in view but eventual cure, has been encouraging. If only the public at large and also physicians would understand the gravity of early symptoms presented by carcinoma of the bladder we should be enabled to get these cases earlier and have much more chance of curing them. The outlook in carcinoma of the prostate is much less favorable. This is not because we have not been able to very decidedly influence and retard, and in a few cases apparently cure these growths by radium, and that with but little inconvenience to the patient, but because there is no sign or symptom which enables either patient or physician to become aware of the condition early in its course. And in 95 per cent or more of these cases when they reach us the carcinoma has already gone beyond the capsule of the prostate. All in all the problem is a much more serious and grave one than that presented by carcinoma of the bladder."

"For a period of six months a needle a week of radium emanation has been sent to the Mayo Clinic of Rochester, Minn., in order that they might try out the efficiency of this treatment in carcinoma of the prostate."

REVIEWS AND ABSTRACTS

Henry H. Janeway, M. D. (New York). The Treatment of Cancer of the Lip by Radium. A Report of Twenty-four Cases. J. A. M. A. LXX, 1051-1058, April 13, 1918.

"Epithelioma of the lip offers favorable conditions for successful treatment, whether by operation or by radium, more frequently than the majority of other forms of epidermoid carcinoma. This circumstance depends, not on less malignant tendencies, but rather on the exposed position of cancer of the lip. A malignant new growth of the lip excites the concern of a patient in a far earlier stage than the same kind of growth inside the mouth. For this reason, patients having cancer of the lip with great regularity seek assistance when their growth is still small and superficial. In these stages cancer of the lip offers particularly favorable conditions for successful treatment by radium. The growth is most accessible and can be completely covered by radium. If it is justifiable to treat any form of early cancer by radium instead of by operation, it is cancer of the lip."

"In the report on radium therapy in cancer at the Memorial Hospital for 1915-1916, the results in the treatment of six patients with early cancer of the lip were published. In four of these patients the disease was superficial, but two had considerable submucous infiltration of the substance of the lip. One of these patients (one of the four with the more superficial cancer) has not been traced to date. When last seen his lesion had entirely disappeared, and the lip appeared normal."

"The remaining five have been traced to January 1, 1918. In one of them a recurrence has developed. This patient (N. N., Hospital No. 22251) was one of the two with considerable submucous infiltration of the lip. He received his single radium treatment, July 7, 1915. The re-

currence developed two years later in the cervical lymphatics, and only his infirmity (he is now 77 years old), rendering him unable for the past months to leave his home, has been responsible for the failure to remove these glands. He still has no local recurrence, and had it been possible to dissect out the glands in the neck at an early period, it is possible that he would still be free from disease."

"The remaining four patients are still free from disease."

"During the past year we have treated eighteen additional cases of epithelioma of the lip with radium. The immediate result has been as favorable as in the first series of cases reported. As we are attempting to do in the six cases of the previous report, we hope to publish the end-results of all cases later. A microscopic confirmation of the diagnosis was obtained in only a few of the patients in whom it could be made without serious inconvenience to them. The microscopic appearance of all these lesions was typical, and the diagnosis in each case was confirmed by several observers at the weekly consultation of the attending staff of the hospital. We considered it unjust to subject these patients to the trauma of a removal of a piece of tissue for section purposes merely to meet the criticism of the incredulous."

"Of the twenty-four cases in this report, eight were judged to be superficial early cancerous lesions, without deep invasion of the muscle. Sixteen were well established cancer, with unquestioned deep invasion of the tissues of the lip. As might be expected, there were no therapeutic failures among the eight superficial lesions."

"Of the whole series of twenty-four cases, twenty-three patients were men, only one being a woman. All but one were carcinomas of the lower lip. The single case of cancer of the upper lip was in a man."

"The average age was 54. The youngest (Patient 11) was 38. The oldest was the woman (Patient 15), aged 84, the next oldest (Patient 1) being 78 years of age. The most frequent etiologic factor seemed to be tobacco, all patients except the woman admitting the use of tobacco in generous amounts."

"In only one patient was syphilis admitted. In two patients (22251 and 24492 [Patient 6]), direct trauma seemed to be a factor. In one of these trauma was caused by the chronic irritation produced by the ragged edge of a decayed tooth. In the other patient the injury to the lip was produced by an oyster shell during eating."

"The duration of the lesion before the patients came to us for treatment is of much interest. This period averaged thirty months, the shortest time being one month, and the longest twelve years. The cases may be classified, with regard to duration, as in the accompanying tabulation."

DURATION OF LESION BEFORE TREATMENT

Number of patients	Duration Before Our Treatments
3 (1 early cancerous)	From 1 to 3 months
5 (1 early cancerous)	From 3 to 5 months
2	From 6 to 12 months
7 (1 early cancerous)	From 1 to 2 years
3 (all early cancerous)	From 2 to 3 years
2 (both early cancerous)	4 years
1	8 years
1	12 years
24 (8 early cancerous)	

"The duration of the disease before treatment, apart from the character of the growth, has little bearing on the prognosis. Two of the eight early cancerous lesions were stated to have begun to develop four years

before treatment, and some of the most malignant had a short period of growth before treatment. The rapidity of growth and size of the lesion are the all important factors determining the malignancy and affecting the prognosis. A long pretreatment history does not necessarily indicate a benign lesion. The critical factor is the rate at which the lesion is growing at the time of treatment. Many lesions that are stated to have begun months or years before suddenly start to grow rapidly a short time before the patients come for treatment."

"It is of much importance to recognize what constitutes a beginning or early cancerous lesion of the lip, and that such lesions uncured have all the potential life-destroying power of established cancer. This stage is the most favorable time in which to treat cancer. No more important progress in the therapeutics of cancer could be made than so improving both diagnostic methods and the education of the public that a larger and larger proportion of patients can be treated in the early stage. It is a stage easily recognized on the skin and lip, less easily inside the mouth, where the surfaces are moist and more hidden, and almost impossible of detection in many other locations. It nevertheless should be the aim of medical science to accomplish the treatment of cancer in this early stage."

"It is the stage above all others in which radium can be counted on to be successful, a remedy toward which patients will not hesitate to turn, as they so often avoid the knife."

"When it has once been definitely established, it is only under the rarest circumstances that the removal of some chronic source of irritation will cure a beginning cancerous lesion."

"In the stage of which we are speaking, as is also often the case in well established or even advanced cancer, a single treatment in experienced hands will produce a cure. In fact, in our cases the best results have followed single treatments."

"With the exception of three cases (4, 13 and 14) now under treatment, in all of which the patients are at present doing well, although the ultimate prognosis is doubtful because all three patients had advanced lesions when they applied for treatment, and Case 1 in which the patient had developed multiple glandular metastases at the time treatment was begun, and another patient with a very extensive local disease involving the whole of one cheek (Patient 10), all patients have been healed, and are now free from evidences of their disease."

"Although the real value of these results will not be settled until a number of years hence, yet if radium is found to be a reliable therapeutic agent in cancer of the lip, it possesses obvious advantages over excision in the treatment of early and therefore, superficial cancer. One of the most important of these is the fact that it attacks the disease from the surface, and therefore in the direction of its shortest diameter. It saves the patient the unnecessary sacrifice of large amounts of healthy tissue, at the same time not incurring the danger that comes from an excision by a division of the tissues too near to the margin of the disease."

"A number of our cases (as 8 and 2) well illustrate the tendency for early cancer of the mucous membranes to spread for some distance on the surface, often far beyond the usual place of excision. Such extensions, although still remaining quite superficial, may have healthy bridges of mucosa between them and the primary starting place of the disease."

"We regard the lymphatic extension as embolic, and believe that the

cervical lymph nodes perform for a time a conservative function. Obviously enlarged nodes should be removed by clean dissections, after the primary disease has been treated, but if possible not before definite retrogression has been obtained by radium treatment. The early dissection of the triangles of the neck, involving as it often does the sacrifice of normal lymphatic glands, may actually be harmful by removing Nature's barriers and cutting across lymphatic trunks which, if left unsealed, may now drain fresh cancerous emboli into the closed wounds of the neck. In our experience many an unnecessary operation has been saved by delaying the operation on the regional lymphatics until there were definite indications for performing it. No harm has resulted from this delay when patients have been able to obey instructions. Possibly there is less danger of lymphatic extension when the primary disease is treated by radium than when it is excised."

"When neck dissections are performed, we believe that it is an additional safeguard to place radium in the wound against the amputated stump of lymphatic channels descending from the primary lesions."

A brief summary of the case reports of the second series of cases of epithelioma of the lip treated during 1917 at the Memorial Hospital is given.

"The degree of success that we have obtained in the treatment of operable cancer of the lip by radium in the series of cases reported above, and the maintenance to date with such regularity of the healed condition in the earlier cases treated, justifies a continuation of the use of radium in operable cancer of the lip. It may be that the lapse of time will require some modification of this judgment. This method of treatment includes the careful observation of the patients after treatment for the possible development of metastatic lymph nodes, and the operative removal of such when they occur, with the implantation of radium in the wound. We believe that the treatment of cancer of the lip by radium will encourage earlier attention to this disease by the patient."

"We recommend the application of radium emanation embedded in molds of the dental compound, and filtered through the thinnest material for the most superficial lesions. As a matter of convenience we have used 0.5 mm. of silver uniformly for all but the lesions with deep infiltration. While 0.5 mm. of silver has been unnecessarily heavy for the most superficial lesions, it has given uniformly satisfactory results in our cases. For the deeper lesions, however, nothing has surpassed the progressive, smooth and complete retrogression produced by filtration through 1 mm. of platinum. The tubes should be sunk 5 mm. in the dental compound, and for the ordinary lesion the dose should be 60 millicurie hours per square centimeter, when the filtration is through 0.5 mm. of silver, and 100 millicurie hours per square centimeter when through 1 mm. of platinum."

"The use of emanation instead of radium element facilitates uniform distribution over the lesion. Provision for uniform distribution is the most important factor in obtaining a successful result. It is true that it is possible to approach the uniform distribution obtained by emanation with the radium element, provided this is put up in many minute tubes; but few users of radium element find it practical to divide their radium thus, and the attempt to treat these lesions by merely placing on them single tubes of radium element is inaccurate and often inadequate."*

*The Editor does not altogether agree with Dr Janeway on this point. A suitable plaeque having the radium distributed over its surface would serve as well, and has the advantage over emanation of maintaining a constant activity. C. H. V.

Hugh H. Young, M. D. and William A. Frontz, M. (Baltimore). Some New Methods in the Treatment of Carcinoma of the Lower Genito-urinary Tract with Radium. Journal of Urology, I, 505-541, Dec., 1917. From the James Buchanan Brady Urological Institute, Johns Hopkins Hospital.

"During the past two years we have treated with radium sixty-six cases of cancer of the prostate. In forty-two of these, the tumor was extensive, not only the prostate but the seminal vesicles being involved. In nineteen the process was confined apparently to one half of the prostate and the corresponding vesicle, while in four the vesicles were apparently free from invasion."

"The diagnosis of carcinoma was made by rectal examination alone in all but four cases. These had previously been operated upon, the tissue removed showing typical carcinoma. The diagnosis of malignancy was confirmed in twelve other cases, nine of which were subsequently operated upon and three coming to autopsy. In the remaining cases in which histological confirmation was impossible, the findings were typical of malignancy."

"The treatment in practically all of these cases has been carried out with 103.7 mgm. of radium element, contained in a thin glass tube 24.3 mm. in length and 3.4 mm. in diameter. In the treatment of all of the cases of prostatic carcinoma, the glass tube of radium has been contained in a capsule of platinum 29.5 mm. in length, 6.5 mm. in diameter and 1.5 mm. in thickness, a screenage more than sufficient to filter out practically all of the irritating beta rays. In the treatment of carcinoma of the prostate and seminal vesicles, three portals of application are available: the urethra, the bladder and the rectum. The platinum capsule with its contained radium is introduced in the beak of a metal instrument, in general outline not unlike the cystocope*."

"*Urethra and Bladder*: The patient lies upon his back on a flat operating table and after the genitalia have been cleansed in a manner similar to that for cystoscopy, the instrument carrying the radium in its beak is introduced and held at the desired point by means of a mechanical arm attached to the table. The prostatic urethra may be so treated that successive treatments do not overlap, the anterior half being treated at one time, the half nearest the bladder at another. The urethra, because of its anatomical relations to the tumor, forms an admirable point of attack and in cases with evident involvement of the lateral and median lobes, a large portion of the treatment is carried out from this site. The seminal vesicles and intervesicular region may be conveniently radiated through the bladder, the capsule being carried just within the internal sphincter and rotated to the right or left or allowed to remain in the mid line. In some of our cases, as much as five hours of radiation have been given during one seance, the position of the radium being changed at hourly intervals. We have made it a rule to chart as accurately as possible the exact position of a given radiation, a straight line indicating the region radiated, opposite which is placed the date and the amount of treatment, reckoned in milligram-hours. By this means the treatment in a given case is graphically shown and too frequent repetition of radiation at one point may be avoided. The resistance of the bladder and urethra, so far as irritation is concerned, is subject to considerable individual variation, but as a rule from twelve to fifteen hun-

*These instruments have previously been described in the Journal of the American Medical Association, April 21, 1917, by H. H. Y. Note by Ed. Dr. Young's article was reprinted in Radium, June, 1917, pp. 41-48.

dred milligram-hours may be given in the course of a month, providing radiation at any one point does not exceed 100 mgm.-hrs. during one treatment, and if the intervals between treatments are of sufficient length."

"Rectal radiation. For these treatments the patient lies upon his side, with the knees and thighs sharply flexed. The radium is introduced into the rectum in the beak of the instrument used for urethral applications and accurately placed over the part to be radiated, being held in position by the gloved finger until grasped by the mechanical arm. It has been our plan before beginning treatment to chart as accurately as possible the outlines of the carcinoma. It is then possible, as shown in the diagram to so plan the treatments as to avoid overlapping, thus decreasing the danger of rectal irritation. As many as fifteen to twenty areas may be thus mapped out and the entire tumor systematically treated. It is well in consecutive treatments to select areas quite widely separated, as for instance the seminal vesicles, or the apex of one lobe and the base of the other, thus reducing the danger of injury to the mucosa. The normal rectal mucosa is so freely movable over the underlying structures that the treatment of adjacent areas in rapid succession cannot be carried out without considerable risk."

"In the trans-rectal treatments we usually endeavor to give from 1500 to 2000 mgm.-hrs. in the course of six weeks to two months, using the same precautions outlined above for the urethra. Usually at the end of this time, there are beginning signs of rectal irritation and the treatment is immediately discontinued, to be resumed some time after the last symptoms have disappeared which is usually in the course of one to two months. The rectal irritation produced by radium is manifested by frequent desire to stool, burning discomfort and the discharge of mucus which may be blood-tinged in the more aggravated cases. Rectal examination at this time may reveal considerable swelling of the mucous membrane or nothing abnormal may be made out. In certain cases having rather marked subjective symptoms, the mucous membrane may be normal to palpation, while in others, experiencing no discomfort whatsoever, the mucosa shows marked thickening. In one of our cases, palpation revealed in addition to marked thickening, definite crepitation as if there were air beneath the mucosa."

"Great variation in the resistance of the mucous membrane has been noted. On the one hand, it may become quite marked after 500 to 800 mgm.-hrs. have been given, while in other cases from 1500 to 2000 mgm-hours, given in proportionately the same time are followed by little or no discomfort. The cause of this great variation in resistance is not always apparent but in our experience, carcinomatous involvement of the rectal wall or pressure upon the rectum resulting from marked enlargement of the prostate, suggests that interference with the blood supply and consequent diminution of regenerative power, may furnish an explanation. These are cases showing as a rule to palpation very little evidence of irritation. The rectal mucosa shows no thickening or ulceration, the chief symptoms being burning discomfort, frequent desire to stool and in some cases the occasional discharge of small amounts of mucus. The appearance of these symptoms, even though there be no palpatory evidence of irritation, calls for an immediate suspension of rectal treatment, the remaining course being carried out through the urethra and bladder."

"Upon cessation of the treatment per rectum, slight symptoms of irritation usually subside in the course of a few weeks. From our expe-

rience it would not seem advisable to resume the treatment per rectum until two or possibly better three months after the last symptoms or other evidence of irritation through palpation have disappeared. Under the head of delayed reactions, may be grouped certain cases having only slight temporary irritation after the first series of treatments. Upon continuing the treatment after too short an interval, marked rectal irritation resulted, the appearance of severe irritation being long delayed, in some instances several months after the last treatment. In the majority of cases from 1500 to 2000 mgm.-hrs. of radium may be given during the course of six weeks to two months without producing marked irritation."

"*External radium treatments.* Our study of these cases would be incomplete were we not to mention the external applications of large amounts of radium to the lower abdomen, perineum and sacrum. These treatments were carried out by Dr. C. F. Burnam. In three cases the treatment was purely external, no urethral or rectal applications being made and these have not been included in this series. In twelve other cases both methods were employed. The radiations were made with from 1500 to 2500 mgm., the duration of the treatment ranging from eight to fifteen hours and the distance from the skin averaging three inches. The three cases receiving external radiation alone showed no improvement. In the remaining twelve the improvement was marked in two cases. One of these was treated through the perineum with 200 mgm. for nine hours at a distance of 3 inches. Subsequently he received 2600 mgm.-hrs. through the urethra and rectum. The consistence of the prostate was greatly reduced and the symptoms, which before treatment were greatly aggravated, cleared up completely. This patient remains symptomatically well today, one year after the treatment. The second case received two external applications and 900 mgm.-hrs. through the urethra. He was seen recently, eighteen months after the last treatment, with marked symptomatic improvement and a prostate somewhat enlarged but not suggestive of malignancy."

"The chief difficulty in external treatments is the great distance of the radium from the lesion to be radiated. The distance is frequently from 15 to 25 cm., while in the internal treatments, particularly the urethral and rectal, it is possible to place the radium almost directly against the neoplasm, in fact separated only by tissues from 1 to 3 mm. thick (the urethral mucosa and the rectal wall). As the potency of the radium varies inversely as the square of the distance from the part to be radiated, the importance of reducing the distance can be appreciated."

"The results from radium treatment of carcinoma of the prostate and seminal vesicles have in many cases been most encouraging. Cases presenting marked urinary obstruction have responded in the course of six weeks to two months and in some instances a large residual urine has diminished to zero. Cases giving a history of voiding from ten to twelve times at night and then only with extreme difficulty and pain, have shown, after a course of treatment marvelous improvement, urination being accomplished in a normal manner. In our series of sixty-six cases nineteen received less than 1200 mgm.-hrs., while the remaining forty-seven were given more than this amount, the radiation in many cases ranging from 3000 to 5000 mgm.-hrs. We have analyzed our results as follows:"

"*Cases with complete retention* In eleven cases retention of urine was complete. In two cases the treatment was less than 1200 mgm. hrs., while in the remainder it averaged about 3,000 mgm.-hrs. The obstruction in these cases, with one exception, showed no improvement, eight of them

subsequently coming to operation for the relief of urinary retention. The single case was only partially benefited and has had to resort to catheter at night since."

"*Frequency and pain.* Fifty-one cases gave a history of more or less frequency and dysuria. In seventeen the radiation was less than 1200 mgm.-hrs. and the improvement symptomatically very slight. In the remaining cases, receiving adequate treatment, the improvement in many was very striking, nine being almost completely relieved of obstructive symptoms, nine showing marked improvement, nine responding only slightly, seven being unchanged.

"*Size and consistence* Those cases which have responded symptomatically have shown also, as a rule, improvement in the size and consistence of the prostate and seminal vesicles. In many instances the prostate has changed from a stony consistence to the normal elasticity. The size has also diminished although in this respect the change has not been so striking. In many of these cases, examination now would lead to a diagnosis of adenomatous hypertrophy. The change in the size and consistence of the seminal vesicles has not been at all comparable to the improvement noted in the prostate."

"In the forty-two cases having extensive involvement, thirty received treatment exceeding from 1200 mgm.-hrs. In eleven of these cases, all of which received from 2000 to 5000 mgm.-hrs., there was a marked change in the consistence, while in three the prostate showed considerable diminution in size and in four there were very definite changes in the size and consistence of the seminal vesicles."

"Of the nineteen cases showing a unilateral involvement (prostate and one vesicle), fourteen received radiation exceeding 1200 mgm.-hrs. Of these receiving from 2000 to 4000 mgm.-hrs., eight showed marked softening of the prostate and in two there were corresponding changes in the vesicle."

"In four of the cases the involvement was confined apparently to the prostate. In three of the cases the radium treatment was short and not completed and no conclusions can be drawn. In the fourth case, the carcinomatous area was small and confined to one lobe. Eighteen hundred mgm.-hrs. were given per rectum and 225 mgm.-hrs. per urethram during the course of ten months. At first there was apparent improvements in the consistence of the area but notwithstanding treatment it later assumed active growth and was completely removed by subtotal prostatectomy. No explanation for the unusual resistance in this case is apparent."

"Of nineteen cases in which there was marked change in the consistence of the prostate, eight showed a striking improvement in uninary symptoms, four a moderate improvement, four slight improvement and three no improvement. "

"In five cases of the series the carcinoma was most resistant to treatment, there being very little change either in the size and consistence of the prostate and seminal vesicles and slight if any improvement in symptoms. One of these cases received radiation exceeding 2500 mgm.-hrs., two exceeding 3200 and two exceeding 5000."

"In four cases a prostatectomy had been performed previous to the application of radium. The tissues removed at operation showed definite carcinoma.

"In fourteen cases of the series with evident metastasis there was

pain in the back, hips or thighs. In none of these cases, of course, was there any alleviation of this symptom following radiation of the primary growth. During the past six months we have had two cases complaining of marked pain in the hip and thigh which have been afforded considerable relief by intensive treatment with the x-ray, which was directed against the region involved in the spine or along the sciatic nerve, particularly in the region of the sacrosciatic notch. By using small portals side by side many exposures, all reaching the deep area involved, but each through a different skin area can be safely made. In a few cases with very severe pain in hip and thigh marked improvement was thus obtained. The Coolidge tube was used, operating at a spark gap of 6½ inches and a current of 20 milliamperes. A screen of 2.5 mm. of aluminum and 4 mm. of glass was employed. The usual distance from focus to skin was 8 inches and the time of exposure two and three-quarter minutes. The focal distance in all exposures was carefully measured and in the event of its being greater or less than 8 inches, the time was either increased or diminished, the time of exposure, other things being equal, being proportionate to the square of the distance of focus to skin. More or less recently we have been raying the abdomen, back and perineum in conjunction with the use of radium. We have endeavored in these cases to secure as many portals of entry as possible, the areas being plotted in 2 inch squares with a 10 per cent solution of silver nitrate which leaves a more or less permanent record. The radiation of a given area should usually not be repeated within a month's time. By following this plan we have seen no erythema following the treatment." Three case reports are given where symptomatic improvement was observed, and twelve case reports in which histological studies were made on tissues after radiation.

"*Radium Treatment of Bladder Tumors.* In the application of radium to bladder tumors the patient is prepared as for cystoscopy. For tumors in the region of the vesical orifice and trigone, an instrument very similar to that employed for the treatment of prostatic carcinoma is used. It is however, a tubular instrument through which an observation cystoscope can be passed, thus enabling the operator to apply the radium accurately to the tumor. For tumors upon the anterior and lateral walls, the instrument just described is sometimes unsatisfactory as the tip of the radium capsule and not the long diameter comes in contact with the tumor. To obviate this difficulty, another type of instrument was devised. It is seen to possess *a beak composed of two hollow halves, and an intermediate shell in which the capsule containing the radium is placed. By a simple screw mechanism, the halves can be separated and thus the shell containing the radium swung out so that its long axis lies parallel to the shaft of the instrument. This instrument also carries a cystoscope making accurate applications possible. Neither of the above instruments is suitable for some tumors lying on the posterior wall. For the treatment of these another design was necessary. This resembles in general outline the instrument first described except that its beak, which is fenestrated, serves as a capsule for the radium. By means of wires concealed in the shaft of the instrument this beak can be made to revolve about its center so that its long axis can be brought to a point at right angles to the long axis of the instrument. The radium can thus be placed broadside upon the tumor."

"In carrying out these treatments we have usually employed a capsule of brass, one side of which is fenestrated, the diameter of the fenestra

*Note. See footnote, p. 56. Ed.

being about one-third the circumference of the capsule. Both the beta and gamma rays are thus utilized, the fenestrated surface of the capsule being placed directly upon the tumor."

"As in treatment of carcinoma of the prostate, it has been our plan to map out the area to be treated and to outline each treatment together with the date and dose given. After the radium has been carried to the desired point the instrument is held in a fixed position by the mechanical arm employed in the treatments described for carcinoma of the prostate. The length and frequency of the treatments varies considerably with the individual case, but as a rule the radiations can be given for a period of an hour once or twice a week."

"This report includes forty-five cases of tumor of the bladder treated with radium alone or a combination of radium and fulguration. Of these cases fifteen were papillomata, thirty carcinomata. Of the papillomata only two were treated with radium alone, the one receiving 350 mgm.-hrs., the other 50 mgm.-hrs. Both tumors disappeared within three weeks after radiation."

"In thirteen cases of papilloma a combination of radium and fulguration was employed. In seven cases the actual effect of the radium cannot be stated. The tumors disappeared but it is possible that many would have responded to fulguration alone. In the remaining 6, however, the radium played apparently a very definite role and it is with a consideration of these cases that we are chiefly concerned. These were all papillary, pedunculated tumors, presenting cystoscopic appearances similar to the type of tumor which usually responds to fulguration. In two of these cases specimens were obtained without cystoscopic rongeur. Both sections showed histologically malignant change in the periphery of the tumor without infiltration, the changes being entirely in the epithelium, there being no evidence of infiltration of the axis of the papilla. In these six cases, the tumors were first treated by fulguration and in all of them the response was either entirely negative or extremely slow. Following a fulguration the tumor might appear as a charred mass and it would seem certain that complete destruction had been effected; yet, upon cystoscopy ten days or two weeks later, the tumor would appear clean, active and of approximately its original size. Repeated fulguration met with the same result although in one of the cases, the treatment was carried out at two weekly intervals over a period of six months with practically negative results. Radium was then applied directly to the tumor, from 200 to 600 mgm.-hrs. being given. So far as could be determined there was little if any cystoscopic change as a result of the radiation. Upon returning to fulguration, however, the response was very prompt, the tumor disappearing in one to three treatments."

"*Carcinoma of the Bladder.* Our results of radium treatment of the infiltrating type of malignant tumor, from a curative standpoint, are most unsatisfactory. In our series of thirty cases, in no instance was there any evident response to the radium, nor so far as we could determine was fulguration influenced by preceding radiation as in the tumors just mentioned. In a few instances hemorrhage has been controlled and in one case with extensive involvement in the region of the vesical orifice there was marked improvement in urination. The application of radium in these cases has been made directly to the tumor and in cases with trigonal and posterior-wall involvemnet rectal radiation has been employed."

"*Concluions.* The use of radium in the treatment of carcinoma of the prostate and seminal vesicles in many cases has resulted not only in

marked symptomatic improvement but in definite reduction in the size and consistence of the tumor. In several of the treated cases subsequently coming to operation it has been possible to secure prostatic tissue for microscopic study. Some of the adequately treated tumors (those obtaining from 1200 to 4000 mgm.-hrs.) show extensive destruction of the cancer cells throughout large areas. In other areas the general architecture of the tumor is altered and the cells and nuclei appear in varying stages of degeneration. The histological change in several of these tumors is most encouraging and it seems probable that radium treatment may have a distinctly curative effect in some of them."

"The internal use of radium either by urethra or bladder or by rectum, by accurate methods of control and fixation, would seem to be productive of far better results than the employment of much larger amounts externally, the chief difficulty of the latter method being the greater distance between the portal of application and the tumor."

"The irritating effect of radium, which was formerly the great objection to its use in the urethra and rectum, can be avoided by the accurate methods of use which we have introduced and if the dose is carefully regulated and if care is used to avoid too frequent application to any one spot. The discontinuance of treatment at the first sign of rectal irritation cannot be too strongly emphasized, for if the treatment be carried beyond this point serious burns may result. Frequent rectal examinations may reveal a thickened rectal mucosa which may be the first evidence of irritation. With the onset of rectal irritation the urethral and vesical radiation may be substituted. The urethral and vesical mucosa is apparently quite resistant to the action of radium and in our series no ill effect has been noted following intensive treatment from these points. In these cases, however, it is well to mention that we have always employed a screen of 1.5 mm. of platinum."

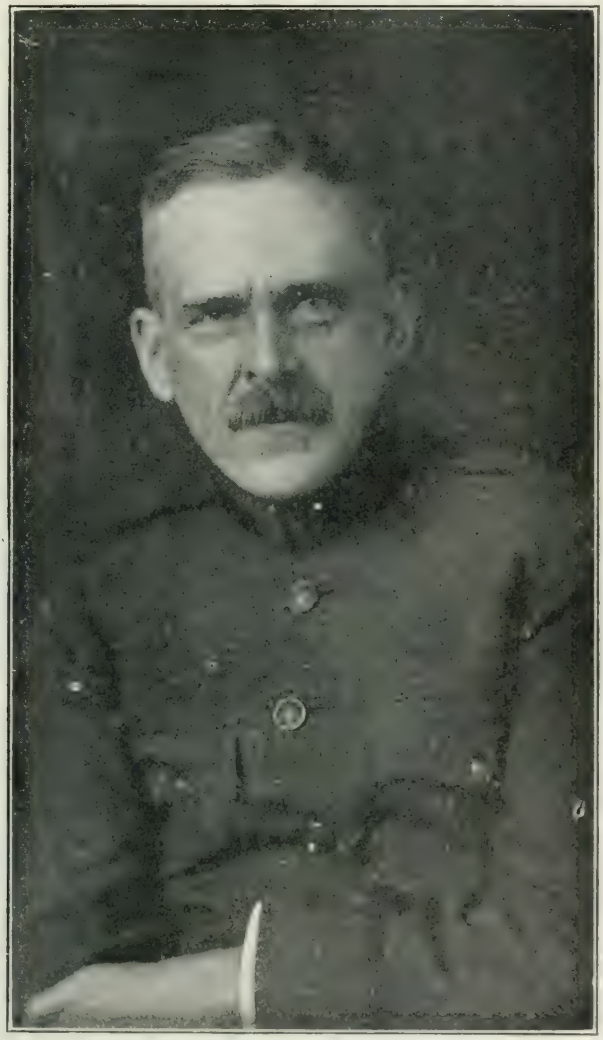
"The determination of a safe interval between the disappearance of rectal symptoms and the resumption of treatment will vary with the individual case, the severity of the symptoms, their duration, the amount of radiation producing the original irritation and the character of the rectal mucosa. Cases having had rather severe and prolonged symptoms should be held for two to three months before rectal treatment is resumed. Where large amounts of radiation have been tolerated, finally resulting in more or less irritation, the interval between the disappearance of symptoms and the resumption of treatment should be much longer than in those cases showing evidence of irritation after a few hundred milligram-hours."

"The results obtained in the radium treatment of bladder tumors have been most satisfactory in the malignant papilloma type which have failed to respond to fulguration. Certain of these cases have resisted most stubbornly the high frequency treatment, but finally responding promptly to it after a few hundred milligram-hours of radium. In our hands the treatment with radium of the infiltrating types of malignant tumor has been less encouraging and in no case in which there was definite infiltration of the bladder wall, as demonstrated either by cystoscopy or by rectal palpation, has a cure been effected."

"In radium we undoubtedly have a most potent agent capable of producing marked changes in malignant tumors as shown both by physical and microscopic examination. That some cases may be completely cured

seems probable, though more time must elapse before accurate final determinations can be made."

"It seems to be proven beyond doubt that close apposition of radium to tumor is very desirable, and that really marvelous absorption of infiltration, disappearance of induration and reduction to normal size and consistence may occur in even extensive cases of cancer of the prostate and seminal vesicles by the accurate instrumental methods here employed."



JOSEPH B. BISSELL, M. D.

Major Joseph Biddleman Bissell, New York; age 59 years, president of the American Radium Society; died at the Mount Sinai Hospital, New York, December first, from acute leucemia associated with streptococcus infection.

At his death Major Bissell held the following appointments: Clinical Professor of Surgery, University and Bellevue Hospital Medical College; Visiting Surgeon, Bellevue and St. Vincent's Hospitals; Consulting Surgeon, Hospital for Deformities and Joint Diseases, German Hospital and Dispensary; Consulting Gynecologist, Ossining Hospital, Ossining; Consulting Radiologist, House of Calvary and Surgical Director of the Radium Institute of New York.

Dr. Bissell entered the U. S. Army early in July of the present year and was commissioned Major and ordered to Camp Custer, Michigan. Later he was placed in active service as Chief Surgeon at the Base Hospital, Fort McHenry, Baltimore, Md. Here he was taken sick four days before his death.

During the long term of twenty years of surgical service at Bellevue Hospital he became deeply interested in the study of malignant diseases. Although one of New York's foremost surgeons he early expressed his distrust of the knife in certain forms of cancer, especially of those neoplasms developing around the face and throat and urged the study of all measures that might hold forth any encouragement. In the spring of 1913 he made a series of personal observations of the excellent results with radium as reported by Dr. Howard A. Kelly and shortly thereafter secured a modest supply of radium and inaugurated his first series of treatments on twenty-two cancers of selected type. Naturally, a man of extreme conservatism, he insisted on most rigid laboratory support. "The clinical results obtained were exceptionally fine, in that fourteen of the twenty-two cases developed into clinical cures while some decided relief or improvement came to every patient." It was this startling first impression that made Major Bissell a lasting and enthusiastic disciple of radium. He maintained that surgery should always be advocated in preference to any other measure in such cases where it afforded a reasonable assurance of success, but he also never hesitated to lay the blame on those surgeons who would not afford their patient the benefit that radium or other measures can supply.

His ambition of years, to be of help to the cancer victim, finally culminated in the opening of the Radium Institute or, as it was first called, the Radium Sanatorium of New York, a beautiful and well-equipped radium hospital of forty beds. This work was inaugurated in July, 1915 with a representative consulting staff of twelve surgeons. Up to the present time about fourteen hundred cases have received treatment for cancer and eight hundred and sixty patients have been treated for cardio-vascular-renal degenerations, chronic arthritis, etc.

Among the special developments in radium therapy inaugurated in this country by Dr. Bissell was the use of radium needles for insertion deep into the structure of malignant masses, as an aid to crossfire application, which has proved remarkably effective in tongue cases. The application of needles and chain tubes in chronic septic sinuses; the transfusion of large amounts of soluble radium solution in normal saline base in pernicious anemia cases, also in post-operative anemias, and the intravenous application of radium chloride solution for the treatment of desperate cases of cardio-vascular-renal degenerations.

* * * * *

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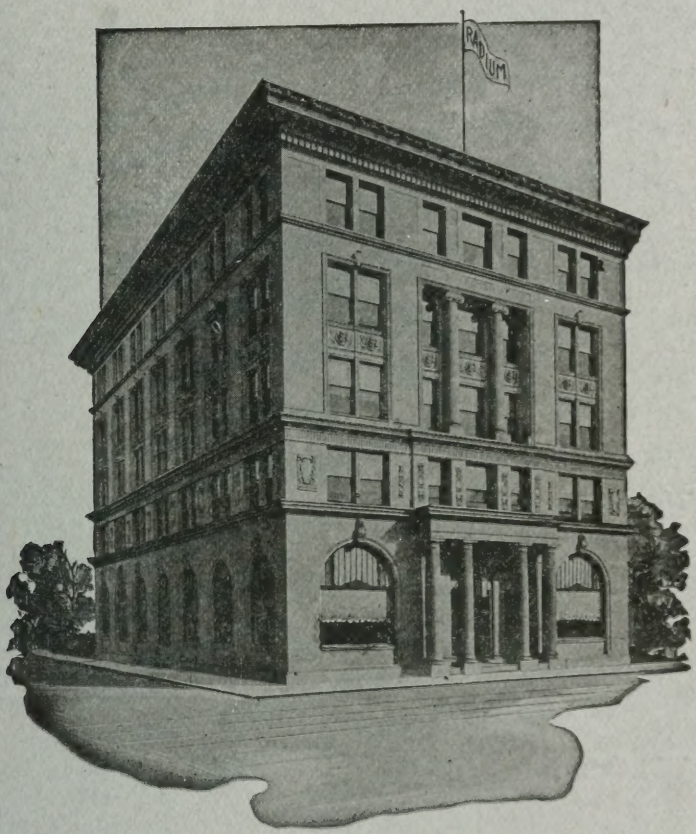

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